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Druzhinin, Pavel V.; Prokopyev, Egor A.

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REGIONAL ECONOMY

AN ASSESSMENT OF THE ECONOMIC PERFORMANCE OF THE EU BALTIC REGION STATES

P. V. Druzhinin[1, 2]
E. A. Prokopyev[1, 3]

The paper explores how the common economic space, a product of the EU, influenced the economies of the Baltic Sea Region states in 1995—2015. The authors investigate changes in the economic performance of the developed (Germany, Denmark, Finland, and Sweden) and Eastern European countries (Poland, Latvia, Lithuania, Estonia) during the integration of the latter states into the EU. Performance dynamics is analyzed for eight EU Baltic Sea Region countries. Three Russian Baltic regions constitute a control group. The authors conduct a production-function-based comparative analysis of development dynamics in individual countries to identify distinctive features for each group. Despite a rapid growth of Eastern European economies, the difference between the region's eastern and western countries remains substantial. Economic convergence between eastern and western EU countries in terms of investment does not lead to convergence in labour efficiency. The capital-labour ratio and the growth rate of labour efficiency in the Russian Baltic are close to the Eastern European average.

Keywords: European Union, integration, production function, efficiency, investment

[1] Institute of Economics, Karelian Research Centre of the Russian Academy of Sciences,
50 A. Nevskogo pr., Petrozavodsk, Republic of Karelia, 185030 Russia.
[2] Petrozavodsk State University,
33 Lenin St, Petrozavodsk, Republic of Karelia, 185910, Russia.
[3] Karelia Branch of the Russian Presidential Academy of National Economy and Public Administration,
6 A Chapaev St, Petrozavodsk, Republic of Karelia, 185002, Russia.

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Introduction

The integration of national economies into the common economic space helps EU member countries remove barriers for a free flow of people, capital, goods and services, thus promoting economic development and enhancing the standards of living. The most vivid example of such an association, arguably,

is the foundation and enlargement of the European Union (the EU). The effects of the European integration on the development of the EU member states have been studied quite profoundly, given the fact that 22 counties have joined the EU since its foundation. [1—6]. Owing to a number of peculiarities, the accession of Central and East European countries to the EU in 2004 deserves special attention. Firstly, 10 new countries simultaneously join the EU. According to the World Bank, this accession added another 103 million consumers to the common pan-European market, enlarging the total EU population to 490 million people. Secondly, the new member-countries lagged considerably behind in the level of their economic development. There are numerous research publications exploring both the forecasts related to this enlargement and its consequences [7—11]. Researchers have mostly focused on the problems of investments [12; 13], migration, employment and unemployment [7, 14—16], which were aggravated by the global financial crisis [17]. The geographic scope of the studies varies from individual EU countries [16, 18] and groups of countries [19, 20] to the entire EU, and the level of territorial division can be down to NUTS 3 [21; 22].

EU enlargement creates new opportunities for the development of both old EU members and new ones. However, there are certain problems caused by each enlargement. More developed member states benefit from getting access to a bigger market [23], and enjoy a wider range of opportunities for supplying their goods to new member states; there is an influx of migrants [7] willing to work under less favourable conditions, although the latter factor may lead to a rise in unemployment. Unemployment can also be caused by the translocation of some production facilities and the migration of investment to less developed EU countries offering lower salaries [14]. On the other hand, by moving low-efficiency enterprises to countries with lower production costs, the developed countries release resources for more competitive high-efficiency industries [24; 25].

Yet, there is another effect to be considered: having received access to new markets, a substantial enlargement of investments in EU member states leads to an increase in prices and salaries, which affects the competitive capacity of the countries' goods in global markets. This was the situation observed after the EU 2004 enlargement in Portugal, Ireland, Greece and Spain, where the growth of salaries entailed heavy budgetary expenditures and shattered the balance of the state budget [26].

Less developed new member states gain a wider access to intellectual and financial resources, most importantly state-of-the-art technology, through foreign investments [11]. This manifests in the construction of new production facilities and the renovation of the existing ones. Unemployment is reduced by migration of the population to the better developed EU countries [7; 15]. Still unemployment may grow since some enterprises are shut down having become uncompetitive after the abolishment of customs duties and the arrival of higher-productivity industries

offering fewer jobs. Let us remark that the accession of East European countries to the EU gave an impetus to the development of the new member states: the volume of foreign investments increased and their economic growth rate accelerated. However, after a period of initial growth, the economic growth rates sharply declined, when the share of direct foreign investments reached 7—15 % of the total volume of investments [27].

The baseline for this study is the following: the enlargement of the EU in 2004 essentially completed the formation of the common economic space in the Baltic Sea region, but the countries of the region differed substantially in their development levels. The better developed Western and Northern countries joined the EU in the 20th century (Germany, Denmark, Sweden, Finland), and the less developed Eastern countries - in 2004 (Poland, Estonia, Latvia, Lithuania). The analysis of a limited number of countries that have similar natural and climatic characteristics but differ in the level of their economic development can demonstrate in more detail the effects of European integration. This can also be done by comparing them with the Baltic regions of the non-EU Russia. This analysis is important for Russia as well, especially in connection with the foundation of the EAEU.

It was in the 1990s that the East European countries became more oriented towards establishing active economic contacts with the better developed West European countries. They initiated the process of accession to the EU, which involved harmonization of legislation and other regulations with the EU standards. Accession to the EU has had a profound effect on their economies. It would be wrong to assume that the enlargement of the EU to the Russian borders has not influenced the economic development of Russia's border regions, which started participating in the EU programmes such as INTERREG, CBC and others. It is therefore expedient to assess how the establishment of the common economic space has influenced the economy of the Russian Baltic Sea region (BSR). An important remark concerning the territories we include in the Baltic Sea region is that this study covers the eight above-listed EU countries, while the Russian BSR includes only three administrative regions (St. Petersburg, Leningrad and Kaliningrad Regions) that border on the Baltic Sea, although some other studies included five administrative regions in this group [28].

This paper focuses on the analysis of changes in the economic performance of BSR countries in the context of EU enlargement and improvements in the economic performance of some of the countries in this region. The article offers a comparative analysis and describes equations assessing and comparing the efficiency indices of the EU member states having similar natural and climatic conditions but different levels of economic development and the Russian BSR. Previous studies have analyzed the effect of the integration on labour productivity, capital-labour

ratio and unemployment dynamics, as well as the relationship between labour productivity and unemployment in the EU at large and in various groups of countries, including those that had simultaneously jointed the EU [1; 20; 29]. In this case, the eight countries chosen for the analysis were considered separately. The approach to estimating the effect of the integration and the main methods and models of data analysis were suggested previously [29]. They were specified and augmented for this study.

Data

This paper analyzes the processes in the Baltic Sea Region in the period from 1995 to 2015. Before 2004, East and Central European countries had been modifying their economies to conform to the EU accession requirements. In research literature there have been only occasional attempts to compare them with the developed countries of 1975—1995. Five out of the eight countries in our study are in the the Euro zone (Germany and Finland since 1999, Estonia since 2011, Latvia since 2014, Lithuania since 2015), but the effect of joining the Euro zone is beyond the scope of this study.

The study assesses economic performance indicators of the eight countries — labour productivity, capital-labour ratio, as well as the ratio of the countries' growth and their growth rates. These indicators were estimated using the data on the gross domestic product (GDP) (for Russian regions — gross regional product (GRP)), investment and employment. The capital-labour ratio is defined as the ratio of cumulative investments (five-year investment aggregate, i. e. the volume of investment in the current year and the four preceding years) to employment; labour productivity is estimated as the ratio of GDP (GRP) to employment (number of people employed).

The data for the study were taken from Eurostat [30] and the WorldBank [31], from the "Eurostat Yearbook" statistical reports [32; 33] and "Regions of Russia" statistical reports [34—37]. The Eurostat database provides the major part of information in a comparable form — in euros and in 2010 prices. To calculate the cumulative investments in EU countries we collected the data on investments since 1991 and converted them to a comparable format using the indexes of physical volume and the share in GDP. For Russian regions, the cost indicators were converted to the comparable 2010 prices via the indexes of physical volume. Since GRP calculations in Russian statistics started in 1996, the data on GRP in 1995 were derived from the indexes calculated by N. N. Mikheeva [38]. The indexes were then converted into the Euro by the average weighted exchange rate for 2010 according to the Central Bank of Russia [39].

First, we analyzed the dynamics of primary and secondary indexes, plotted graphs, determined country-specific features, major tendencies and points at which they changed, compared the dynamics of the indexes in EU countries and the Russian BSR. The analysis shows that labour

productivity in Germany has changed very little; its growth in Denmark and Finland is only slightly higher. Sweden is the only exception: this indicator increased approximately 40 % over the period in question, i. e. on average 1.7 % annually. At the same time, the rise of labour productivity in East European countries has been 2—2.5-fold, i. e. more than 4 % per year on average. The annual growth was lower only in Poland — 3.6 %. The average yearly growth rate in the Russian BSR was also 4 %. This growth was due to new production facilities and introduction of new technologies. The growth rates in the East European EU member states and the Russian BSR were similar.

The probable reasons for the low growth of labour productivity in Germany are the following ones: investments in the country's economy has increased very little for the last 20 years and the capital-labour ratio (determined on the basis of the total amount of investments in the last five years) has increased less than 5 %. The growth of the capital-labour ratio in the other three developed countries was higher — roughly 1.5-fold. The growth of this index in the less developed countries was very high, ranging from 2.6-fold in Latvia and the Russian BSR to nearly 3.5-fold in Estonia and Poland. It was the increase in investments that boosted labour productivity. If, however, we look at changes in the output/capital ratio, defined as the ratio of GDP to cumulative investments, Germany's economy proved to be the most effective: the country's GDP was growing faster than the cumulative investments. In the majority of the EU countries and the Russian BSR the increase in investments somewhat exceeded the GDP growth, this gap being the biggest in Poland and Estonia, and the output/capital ratio in these countries dropped by more than one third.

Another parameter considered was the ratio between labour productivity growth over 20 years and the capital-labour ratio averaged over this period (or in specific years). It is used to measure the degree to which the investment input influences the growth of labour productivity. Here again we see a significant divergence between the developed countries and the East European countries. Germany demonstrated the worst results. Denmark and Finland's indices were roughly one and a half times higher, and those of Sweden were twice as high. In Germany, it takes seven times more investments per an employed person than in Lithuania to achieve the same growth in labour productivity. It turns out that in developed countries, especially in Germany, the efficiency of new investments for building up the capital-labour ratio is low. New capacities develop out the existing facilities with a high capital-labour ratio, and a lot more investments will be needed to acieve even a slight increase in labour productivity as compared to Latvia or Lithuania. However, the situation with growth rates is somewhat different due to the differences in labour productivity levels.

The structure of the economies of the countries in question changed markedly over the study period (1995—2015). The share of manufactur-

ing decreased in the majority of the Baltic Sea Region countries. The exceptions are Germany and Lithuania, where it increased. In Germany, this share remained stable through the entire period except for 2009, the year most affected by the global financial crisis. The share of manufacturing dropped the most significantly in Finland (by 8.4 percent) after 2009. Among the more recent EU member states, the heaviest decline of this index was observed in Latvia (7.5 percent). The share of manufacturing in the Russian BSR decreased insignificantly, approximately as in Denmark and Poland. It is generally slightly lower than in Germany but higher than in other countries. The share of manufacturing is the lowest in Latvia.

Methodology

Having analyzed the dynamics of the key parameters for the Baltic Sea Region countries, we moved to plotting the graphs of the primary and secondary economic indexes to determine whether and how they were related. Graphs for individual countries and for the two country groupings (developed countries vs. East European countries and the Russian BSR) are examined. Relying on the analysis of the graphs we revealed the correlation between the indexes, built mathematical models and performed calculations to determine how changes in the efficiency parameters varied among the countries and their groups. Homogenous and non-homogenous Cobb-Douglas functions were calculated for time-series data for individual countries:

$$y_i(t) = A_i \times k_i^{\alpha_i}(t), \tag{1}$$

$$Y_i(t) = B_i \times K_i^{\alpha_i}(t) \times L_i^{\beta_i}(t) \times \exp(\delta_i \times t), \tag{2}$$

where: *A, B* are constants; $y_i(t)$ is labour productivity in the country *i* in the year *t*; $k_i(t)$ is the capital-labour ratio in the country *i* in the year *t*; α, β, δ are constants; α, β are factor elasticities; δ is the neutral progress rate; $Y(t)$ is the gross domestic product (GDP) or, for the Russian BSR, gross regional product (GRP); $K(t)$ is the cumulative investments (in this paper summed over five years); $L(t)$ is the employment. Factor elasticities represent the change of the resultant index at a 1 % increase in the factor. In our case they demonstrate the efficiency of investment — how much the increase in cumulative investments (capital-labour ratio) by 1 % will modify the GDP (labour productivity).

Analyzing the data, we investigated the possibility of building a model based on panel data for developed countries and East European countries separately:

$$y_i(t) = A_i \times k_i^{\alpha}(t), \tag{3}$$

where A_i is country-specific and α is cross-cutting.

Standard R statistical software packages were used for the calculations. The analysis of the results permitted comparing the efficiency of the development of the Baltic Sea Region national economies and assessing the potential for its change using production functions (1).

Results of Calculations

We plotted a graph to determine the dependence of labour productivity on the capital-labour ratio. The graph shows that the division into the two groups is justified (Fig. 1). The differences between the two groups are conspicuous, while distinctions inside the groups are much smaller, although still present among developed countries: labour productivity in Denmark is notably higher while the capital-labour ratio is the same. In the developed countries, both indexes have been significantly growing but they are slightly higher in Germany. The curves representing three countries are almost parallel, and Germany demonstrates a relatively minor increase in capital-labour ratio and yields a greater increase in labour productivity.

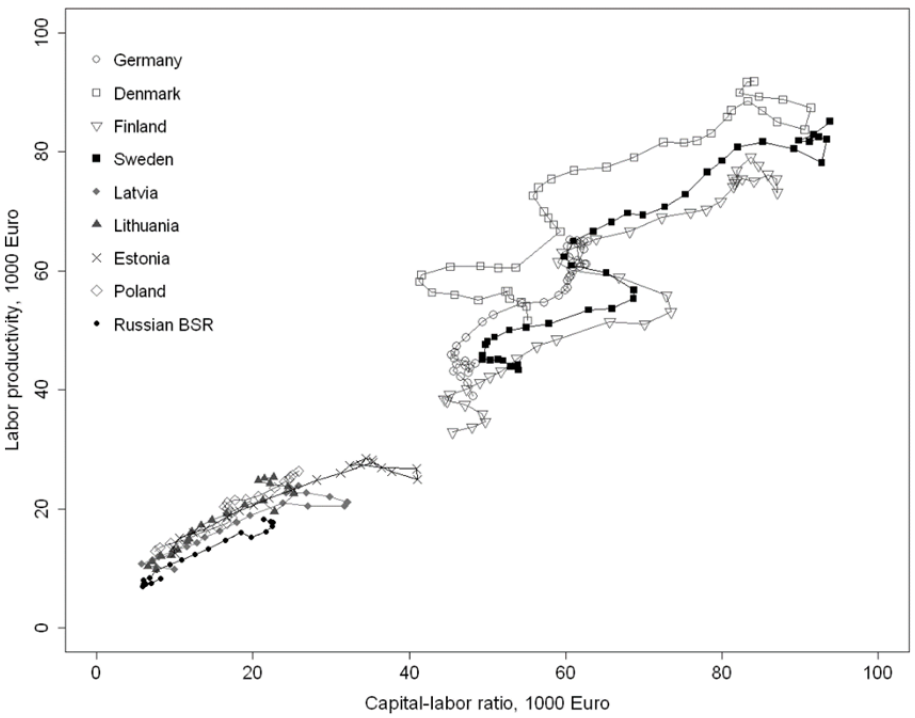

Fig. 1. Capital-labour ratio and labour productivity in BSR countries

The curves for East European countries are nearly coincident, with somewhat higher indexes in Estonia and the rest of the countries and regions falling slightly behind but following the same pattern. The Russian BSR lags slightly behind East European countries, and this gap is due to the smaller amount of investments and their lower efficiency.

The correlation between labour productivity and capital-labour ratio has been changing. One can say that in the 2010s East European countries nearly reached the level of labour productivity and capital-labour ratio observed in the developed countries in the early 1970s, but the tendencies were somewhat different. If the curves are extrapolated they will cross but not continue each other. After catching up with the developed countries in the capital-labour ratio, the East European countries will still have a lower labour productivity. The developed countries had a capital-labour ratio of around 40,000 euros in the 1960s, but their labour productivity was growing at a higher rate. Today, there has to be a much greater increase in the capital-labour ratio to gain in labour productivity, and a build-up of investment volumes will yield a far lower increase of labour productivity in East European countries. A change of the path would require a leap of efficiency through major technological changes, transition to groundbreaking technology.

The plot suggests that in addition to equations for individual countries it is possible to make equations for the two country groupings, since the dependence of labour productivity on the capital-labour ratio is similar within each of the groups.

To show the correlation between labour productivity and capital-labour ratio according to the functions (1), for individual countries (2) and for the two groups we plotted another graph (Fig. 2), investigating the change in labour productivity and capital-labour ratio since the baseline year. The initial year for the Northern and Western countries was 1975, and for the East European countries — 1995 (their earlier data are not comparable). The graph demonstrates that the growth of labour productivity in the East European countries over 20 years was roughly the same as in the developed countries over 40 years, but in order to attain it the former had to increase investments far more substantially, with a much lower return.

To estimate the output elasticity of cumulative investments calculations were run by the formulas (1) and (2) for the eight countries and the Russian BSR. It turned out that the elasticity was near to 1 for all the developed countries. For the East European countries the elasticity was on average one and half times lower. Elasticity measures the percent by which labour productivity will increase if the capital-labour ratio (cumulative investments per one employed person) is increased by 1 %.

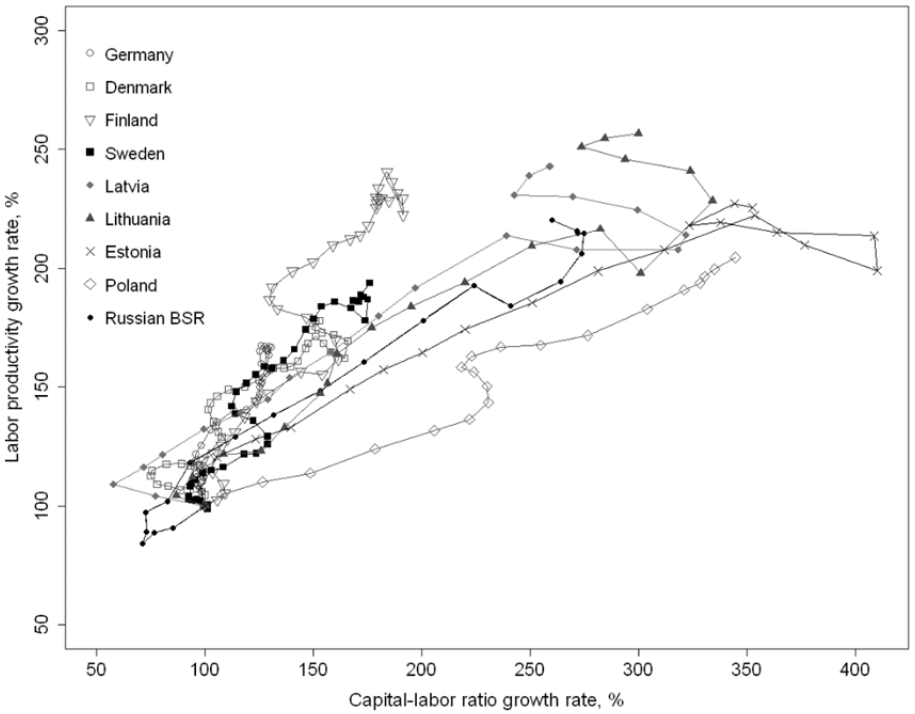

Fig. 2. Changes in capital-labour ratio and labour productivity in the Baltic Sea Region countries (1975—2015 for developed countries, and 1995—2015 for East European countries)

The plots show that calculations with the panel data can be run for the two sectors separately — for four Western countries and five East European countries, including the Russian BSR. In this case, factor elasticities are constant, and free terms are country-specific. Table 1 shows the results of the calculations by the formulas (1) and (3).

The results demonstrate a high efficiency of the Western countries — the factor elasticity is almost 1, i. e. a 1 % increase in the capital-labour ratio (cumulative investments per one employed person) yields a nearly equal increase in labour productivity. The efficiency of investments in the East European countries is more than one a half times lower, as corroborated by the results of calculations for individual countries. If the investments in the East European countries continue growing at the same rate, their capital-labour ratio will match the current level in the developed countries, but the labour productivity will climb only to the early 1990s level. In all probability, however, the growth of investments will be slowing down, and the East European countries will be catching up at an even slower pace.

Table 1

Results of the calculations for the Cobb-Douglas production function parameters in equations (1) and (3) based on the panel data for Baltic Sea Region countries (t-statistic in parenthesis)

Index	Developed countries	Developed countries	East European countries	East European countries
lnA	0.186 (0.96)	– 0.0002 (– 0.001)	1.070 (15.2)	1.005 (23.0)
α	0.947 (20.2)	0.980 (29.1)	0.634 (25.5)	0.588 (36.3)
$\ln A_1$	0	0.065 (3.1)	0	0.226 (8.6)
$\ln A_2$	0	0.204 (10.2)	0	0.164 (6.7)
$\ln A_3$	0	– 0.061 (– 3.1)	0	0.269 (11.1)
$\ln A_4$	0	0	0	0.318 (12.9)
R^2	0.72	0.87	0.86	0.95
F	406.6	270.0	648.8	413.8
P	0.0000	0.0000	0.0000	0.0000

During 1995—2015, the East European counties raised their labour productivity almost to that in the developed countries: from around 15 % to nearly 30 %, but the lag in absolute numbers increased.

Having examined the approximation plots, we can see that the free term A_i demonstrates the efficiency of the countries in comparison to each another, and the countries can be ranked in the following way (Fig. 3). The capital-labour ratio being equal, the country with a higher coefficient A_i will have a higher labour productivity. Among the developed countries, the highest efficiency was shown by Denmark, followed by Germany, Sweden, and Finland. In the East European group, the efficiency was the highest in Poland, followed by Lithuania, Estonia, Latvia, and the Russian BSR. The worst results in each of the groups were demonstrated by the countries where the share of manufacturing declined the most (Finland and Latvia). The highest efficiency, on the other hand, was observed in the countries with a slight reduction in the share of manufacturing (Denmark and Poland).

Several formulas (1) were used to predict changes in labour productivity until 2035. In the optimal scenario for the East European countries, provided the average rate of increase in investments is maintained, Esto-

nia will catch up with developed countries in terms of the capital-labour ratio, Poland will match their level of 2015, and Lithuania — the level of 1995. In terms of labour productivity, however, they will only get to the level demonstrated by developed countries in 1990. Latvia and the Russian BSR will by 2035 match the 1995 level of the capital-labour ratio of developed countries, but their labour productivity will be 1.5—2 times below the 1995 level of developed countries. In reality, however, the rate of increase in the capital-labour ratio in developed countries has on average been quite steady since the 1970s, whereas in East European countries it has been gradually declining towards the rate observed in developed countries, i. e. 2—3 % a year, on average. Hence, the gap in labour productivity levels will be growing.

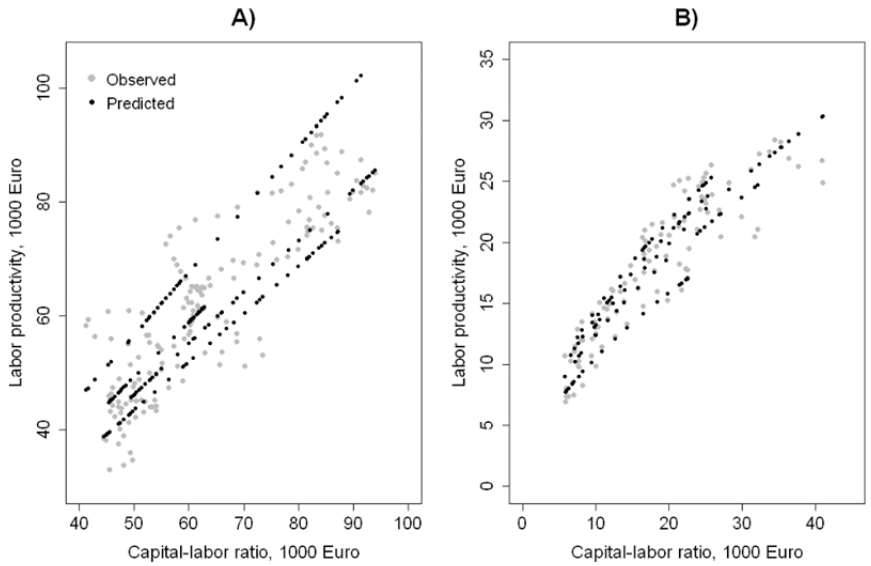

Fig. 3. Observed (gray dots) and estimated (black dots) data obtained from formulae (3) for developed (A) and the East European (B) countries; equation parameters are shown in Table 1

Discussion

The comparative analysis of the development of the Baltic Sea Region countries that joined the European Union (EU) at different times and the Russian BSR showed that although the national economies of the East European countries have been rapidly growing, they still lag behind the developed countries and the differences between the two groups of BSR countries remain substantial. The translocation of the not so new facilities and technologies to the East European countries has resulted in

a situation where in spite of the rapid growth of investments their efficiency is much lower than in the developed countries. Catching up gradually with the developed countries in terms of investment volumes, the East European countries are reducing their lagging behind in labour productivity very slowly. The growth of the capital-labour ratio being equal, the developed countries demonstrate a much higher growth in labour productivity. By drawing the production functions for countries individually and for groups of countries we compared the efficiency of the economic development within each group of countries and ranked them. The Russian BSR proved to be quite close to East European countries in its development efficiency, although lagging behind slightly.

One should remark that within EAEU Russia is a technological leader, exporting its technology to other EAEU countries. Given sanctions, the flow of the latest technology from developed countries to Russia is impeded, which means that innovation projects should be given more support to accelerate the increase in labour productivity for sustainable growth of the economy.

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The authors

Prof Pavel V. Druzhinin, Leading Research Fellow, Department of Regional Development Modelling and Forecasting, Institute of Economics, Karelian Research Centre of the Russian Academy of Sciences, Russia; Professor, Department of Economics and Management, Institute of Economics, Petrozavodsk State University, Russia.

E-mail: pdruzhinin@mail.ru

Dr Egor A. Prokopyev, Research Fellow, Department of Regional Development Modelling and Forecasting, Institute of Economics, Karelian Research Centre of the Russian Academy of Sciences, Russia; Associate Professor, Department of Economics and Finance, Karelian Branch of the Russian Presidential Academy of National Economy and Public Administration, Russia.

E-mail: e_prokopiev@mail.ru

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